Progress in Community Health Partnerships: 2007 Vol. 1.1 49-60

ORIGINAL RESEARCH

Fit for Life Steps: Results of a Community Walking Intervention in the Rural Mississippi Delta

Jamie Zoellner, PhD[1], Carol Connell, PhD[1], Ross Santell, PhD[2], Thomas Fungwe, PhD[2], Earline Strickland[3], Amanda Avis-Williams, MPH[1], Kathleen Yadrick, PhD[1], Kristi Lofton, MS[1], Marjuyua Rowser, MS[1], Alicia Powers[1], Gwendolyn Lucas, MS[2], Margaret Bogle, PhD[3]

(1) The University of Southern Mississippi, Department of Nutrition and Food Systems; (2) Alcorn State University, Department of Human Sciences; (3) USDA/ARS–Delta Nutrition Intervention Research Initiative

This research was supported by ARS/USDA cooperative agreement no. 6251-52000-0020-000.

Submitted 9 June 2006; revised 18 August 2006; accepted 22 August 2006.

Abstract

Background: A collaborative community–university–U.S. Department of Agriculture(USDA)/Agricultural Research Service (ARS) partnership developed and implemented a 6-month walking intervention whereby volunteer coaches were trained to lead community walking groups in a rural Mississippi Delta Community.

Objective: Assess the feasibility of implementing community-based participatory research (CBPR), increase physical activity, and improve anthropometric and biological measures.

Methods: This quasi-experimental design examined body mass index, percent body fat, waist circumference, blood pressure, blood glucose, lipid profile, self-reported walking, stages of change, social support, self-efficacy, and decisional balance at enrollment, 3 months, and 6 months. Participants were primarily African-American (99%) women (97%). Changes were evaluated using repeated measures analysis of variance (ANOVA) and Friedman's test.

Results: Community members actively participated in assessing the problem, identifying the intervention, intervention planning, data collection, and evaluation. Of the 83 enrolled participants, 66 (80%) completed the intervention. Participants exhibited significant improvements in waist circumference (–1.4 inches), systolic blood pressure (–4.3 mmHg), and high-density lipoprotein (HDL) cholesterol (+7.9 mg/dL); ($P < .001$). Self-reported walking per day was 44.8 (SD+52.2) minutes at enrollment, 76.6 (SD+166.6) minutes at 3-months, and 65.9 (SD+89.7) minutes at 6 months ($P = .154$). A positive stage of change shift occurred in 57% of participants; however, no significant positive changes occurred in the other psychosocial variables.

Conclusion: The process of developing and implementing this CBPR walking intervention was considered successful as evidenced by the community's active contribution and participation in each phase of this research, the undertaking and application of basic research components, significant improvements in several anthropometric and biological values, and sustainability of the collaborative partnership.

Keywords

nutrition, exercise, vulnerable populations, health priorities, rural health

Mississippi, Louisiana, and Arkansas repeatedly receive the worst rankings in state health standings owing in large part to the vulnerable population living in the Lower Mississippi Delta (Delta) region.[1] The region is predominantly rural, with a high concentration of African-Americans, high rates of poverty, and low educational achievement.[2] Residents in the Delta suffer a disproportionate amount of chronic diseases including obesity, heart disease, diabetes, and hypertension.[3,4] Because a variety of individual, community, and environmental factors affect the health patterns of Delta residents, opportunities for interventions to improve the health and nutritional status of this population appear abundant.[5] However, utilizing traditional research techniques and experimental

methodologies in the Delta population is extremely problematic because of the geographical location of this population, difficulties in recruiting and retaining minorities, low literacy rates, lack of local health professionals and services, and lack of local qualified researchers to oversee intervention activities.[6–8] Consequently, community-based participatory research (CBPR) methodologies linking community members with academic and government partners to collaboratively identify and prioritize health problems, and develop and implement intervention strategies, has far-reaching potential in Delta communities.[9]

The Lower Mississippi Delta Nutrition Intervention Research Initiative (Delta NIRI) was established to assess the nutrition and health status of Delta residents and develop and evaluate sustainable CBPR nutrition interventions.[10] This tri-state consortium consists of three rural Delta communities (one each in Mississippi, Louisiana, and Arkansas), the USDA/ARS, seven university partners, and each state's cooperative extension service. Early phases of this initiative assessed the nutrition and health needs of Delta residents to help direct intervention research.[3,5,9] Each state then established a community participatory structure to evaluate the nutrition and health needs of its individual community. In the most recent phase, a variety of CBPR interventions are being conducted within each community to improve the nutrition and health of Delta residents.

This paper describes the CBPR methods and *Fit for Life* Steps intervention in Hollandale, Mississippi. The Hollandale Nutrition Intervention Research Initiative (HNIRI), in collaboration with USDA/ARS, Alcorn State University, The University of Southern Mississippi, and the Mississippi State University Cooperative Extension Service developed and implemented a walking intervention in Hollandale, which consisted of training and empowering community volunteers to lead community members in walking groups. The primary aims were to (1) assess the feasibility of developing and implementing a CBPR intervention in Hollandale, (2) increase physical activity of community members, and (3) improve anthropometric and biological measures related to physical activity. Secondary aims were to test the application of two behavioral theories, including social support and the transtheoretical model (TTM), and improve psychosocial constructs related to physical activity behaviors.

METHODS

The Hollandale Community and Hollandale Nutrition Intervention Research Initiative

Hollandale, Mississippi is a community of approximately 3,440 residents located in Washington County.[2] African-Americans comprise 83% of this community, as compared to 36% in Mississippi and 12% nationally. The median income, educational achievement, and literacy proficiencies of residents are low compared to state and national averages.[2,8] Hollandale has one school district, a city government with one mayor and five aldermen, twenty-six churches, and seven eating establishments. HNIRI was established in 2003 to unite community members and researchers in evaluating and improving the nutrition and health status of Hollandale residents. This group meets monthly and includes approximately 20 community members, seven university representatives, one ARS representative and one extension representative.

Obtaining Community Input

Hollandale community members were involved in every phase of the CBPR process including assessing the problem, identifying the intervention, intervention planning, data collection, and evaluation. A two-part Comprehensive Participatory Planning and Evaluation (CPPE) Causal Analysis Workshop was held in July and October of 2003.[12] The CPPE approach was used to engage community members in comprehensive intervention planning. Twenty-one community members, one ARS, and nine university representatives participated in the first workshop. Nine members each from the community and the universities and one ARS representative attended the second workshop. The primary workshop objectives were to (1) identify key problems and issues contributing to the nutrition and health status of the community, (2) identify individual, behavioral, and environmental skill targets and resource factors associated with key problems, and (3) identify objectives and activities to address key problems. The top three nutrition and health problems identified included lack of physical activity, intake of unhealthy food, and lack of nutrition knowledge. Workshop participants developed causal models to identify root causes for these problems, and identified objectives and

activities to address root causes.

In May 2004, HNIRI collaborated with the City of Hollandale and local businesses to build a walking trail. Prior to the installation of the walking trail, no other physical activity facility, such as a gym, health club, or track, was available. The one-eighth mile oval walking trail was built around an established community playground. The resulting CPPE workshop achievements and installation of the walking trail signified capacity building within the community, and the community urged researchers to initiate an intervention promoting the walking trail. In response to the physical activity causal model and literature on community-based approaches to promote walking,[13–15] the proposal evolved to empower walking coaches to lead walking groups.

Theoretical Framework of Walking Intervention

Two theoretical frameworks, social support and TTM, were applied to understand exercise-related psychosocial changes.[16] Previous research establishes that social support predicts high physical activity levels and is associated with the adoption of exercise.[17,18] Social interactions have been cited as a primary motivation for wanting to exercise.[19] These findings imply that social aspects of physical activity should be emphasized and people should be encouraged to engage in exercise with partners.

The TTM provides an integrative structure for exploring exercise-related behaviors and has three central constructs including the stages of change, self-efficacy, and decisional balance.[20–22] The stages of change focus on both current behavior and behavioral intention by having participants indicate their readiness to engage in exercise. *Self-efficacy* refers to the participants' confidence about performing exercise under different situations or conditions and is built on the premise that a person's confidence about performing exercise is highly associated with actual ability to exercise. Decisional balance requires participants to assess the benefits (pros) and costs (cons) of exercise. The present and future likelihood to participate in exercise is related to the benefits outweighing barriers.

Both theories provided a conceptual framework for planning, implementing, and evaluating intervention components. Although both theories have been applied in multiple research contexts for a variety of populations, little research, including development and validation of measurement instruments, has been conducted in disadvantaged African-American populations.[16,23,24] Therefore, a secondary aim of the research was to test the internal reliability of previously validated instruments and assess the utility of these questionnaires in the Hollandale community.[21,25,26]

Intervention Design

This 6-month intervention focused on improving physical activity and health through walking teams led by supportive coaches, self-monitoring, and monthly nutrition and physical activity educational sessions. Coaches were trained to lead a walking group, contact walking members, and document intervention-related contacts. Participants were instructed to set weekly personal walking goals. No defined amount of walking was required to participate in the intervention. Coaches were asked to contact group members a minimum of one time per week to encourage goal setting and walking. Group walking was encouraged, but not required. Coaches were responsible for collecting and submitting weekly walking logs to the HNIRI office, and received six $25 monthly incentives for turning in completed contact and walking logs and assisting with intervention-related activities.

Five 1-hour education sessions were delivered, one each month of the intervention. Education session topics included (1) goal setting and motivation, (2) healthy body mass index (BMI) and caloric needs, (3) label reading and portion control, (4) beverage consumption, and (5) recipe modification. Water bottles, recipe boxes, pot holders, and measuring spoons were given to encourage attendance. The sixth and final session was a celebration. At each session, coaches received a report on their group's walking activity to share with their team members. The walking logs and educational sessions were the process data component of this intervention and a complete and accurate description of analyses and results are not possible within this manuscript's framework.

Recruiting and Training Coaches

The HNIRI committee nominated adult community members as potential coaches. These individuals were

invited to an orientation session, which included an explanation of the research study design and intervention activities, health benefits of walking, and responsibilities of coaches. Those interested in serving as a coach were invited to attend a three-part coaches training session. A community –university–government committee developed the content, agenda, and schedule for the coaches' training sessions. Attendance records were kept to ensure each coach participated in all training sessions.

Recruiting and Training Walking Participants

Coaches were responsible for recruiting community members to participate and for communicating intervention-related activities and participation requirements to walking group members. Coaches invited identified participants to visit the HNIRI office for step-count gait assessment and instruction on pedometer use and walking logs. Subsequently, walking members participated in each data collection.

Recruiting and Training Data Collectors

Local and neighboring community members were recruited to serve as data collectors. Job announcements included flyers posted around the Hollandale community and an advertisement in the daily newspaper serving the community. A community–university–government hiring committee screened, interviewed, and hired data collectors. University partners developed training protocols and manuals, and scheduled and conducted the training sessions. All community data collectors were required to attend a two-day training and certification session. Attendance and certification records were kept to ensure adequate training of all data collectors.

Outcome Measures

Outcome measures included anthropometric measurements, biological values, self-reported walking, and psychosocial constructs at enrollment, 3 months, and 6 months. All outcome data were collected at the HNIRI office. At enrollment, all participants completed a medical disclaimer and informed consent as approved by University of Southern Mississippi's and Alcorn State University's Institutional Review Boards. Height was measured without shoes using a stadiometer (Shorr Height Measuring Board, Olney, MD). Waist circumference was determined using a nonstretchable flexible measuring tape. Body weight, BMI, and body composition were determined by bioimpedance analysis using model TBF 310 Tanita scale (TANITA Corporation of American, Inc., Arlington Heights, IL). The validity of this instrument has been previously established.[27] Blood pressure was measured with the OMRON HEM-907XL (OMRON Healthcare, Inc., Vernon Hills, IL). Fasting total cholesterol (TC), (HDL-C), (LDL-C), triglycerides (TG), and glucose levels were determined via finger stick method using the Cholestech LDX (Choletech Corporation, Hayward, CA).

At each measurement point, participants also completed face-to-face interview-administered questionnaires, including past week physical activity, social support, stages of change, self-efficacy, and decisional balance. Previously developed and validated instruments and scoring procedures were used. The Past Week Physical Activity Recall was originally developed for use in the U.S. Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance Survey and subsequently used in the Jackson Heart Study.[28,29] Participants were shown a calendar of the past seven days and asked to report the days per week and minutes per day they "walked for at least 10 minutes at a time while at work, for recreation, exercise, to get to and from places, or for any other reason." Social support for exercise from family and friends were both assessed using the same 13-item questionnaire.[26] Participants identified how often on a 5-point Likert scale, ranging from 1 (none) to 5 (very often), friends and family provided support for exercise in different situations. The social support instrument yields two subscales for family and one subscale for friends. Stage of change was measured by each participant reporting their readiness to adopt regular outdoor exercise on an 8-point scale ranging from 1 (negative precontemplation) to 8 (long-term maintenance).[25] Self-efficacy was assessed using a 16-item questionnaire that required participants to indicate their level of confidence to exercise on a 5-point Likert scale ranging from 1 (not at all confident) to 5 (completely confident).[21] This instrument yields a total self-efficacy score and six subscales of self-efficacy, including negative affect, excuse making, must exercise alone, inconvenience to exercise, resistance from others, and bad weather.

Decisional balance was assessed by participants indicating how important 16 different statements were in impacting their decision to exercise.[21] The 5-point Likert scale ranged from 1 (not at all important) to 5 (extremely important). This instrument yields a total decisional balance score, a pro subscale, and a con subscale.

At each data collection point, participants received a $20 incentive and a "Know Your Numbers" card with their recorded anthropometrics and biological values. After all outcome data were analyzed, walking participants were invited to attend a meeting where overall intervention findings and implications were discussed.

Quality Control

At each data collection, one ARS member and three university members were present to ensure quality control

Table 1. Gender, Race, Age, Marital Status, and Education Level of Coaches and Walking Participants Completing the Intervention

	Coaches (n = 8)		Participants (n = 58)		Total (N = 66)	
Demographic Variables	Count	%*	Count	%*	Count	%*
Gender						
Female	8	100	56	97	64	97
Male	0	0	2	4	2	3
Race						
African-American	8	100	57	98	65	99
Other	0	0	1	2	1	2
Age at enrollment (yrs)						
< 20	0	0	1	2	1	2
20–29	0	0	6	10	6	9
30–39	1	13	14	24	15	23
40–49	3	38	10	17	13	20
50–59	2	25	20	35	22	33
60–69	2	25	5	9	7	11
≥ 70	0	0	2	3	2	3
Marital status						
Now married	5	63	25	43	30	46
Widowed, divorced, or separated	1	13	11	19	12	18
Never married	2	25	22	38	24	36
Highest level of education completed						
< 6th grade	0	0	1	2	1	2
6–9th grade	0	0	2	3	2	3
10–11th grade	2	25	4	7	6	9
12th grade (HS or GED)	1	13	19	33	20	30
Trade or vocational school	0	0	3	5	3	5
Some college	2	25	11	19	13	20
College degree	0	0	12	21	12	18
Some graduate/professional school	1	13	2	3	3	5
Graduate level/professional degree	2	25	4	7	6	9

* Because of rounding, values may not equal 100%.

of data collection procedures. A data collection manager reviewed all data forms for completeness of data, unrealistic values, and readability of hand writing. Data records were transmitted to University of Southern Mississippi where university partners directed data entry, management, and analyses.

Statistical Analysis

Descriptive statistics were used to assess recruitment and participation rates, demographics, and attendance records for coaches training and data collectors training. For participants completing all three data collections, changes in anthropometric measures, biological measures, and average daily minutes of walking activity were evaluated. Repeated measures analyses of variance (ANOVA) were used to evaluate data meeting the assumptions of normality, and the Friedman's test was used to analyze nonparametric data. Internal reliability of the psychosocial instruments was tested with the enrollment data using Cronbach's α. If the psychosocial instruments were found reliable as evidenced by a Cronbach's $\alpha > .70$, repeated measures ANOVA were used to evaluate changes in social support, self-efficacy, and decisional balance. Descriptive statistics were used to describe shifts in stages of change. For all ANOVA and Friedman's tests, *P*-values $\leq .05$ were considered significant.

RESULTS

Approximately 40 adult community members were nominated to serve as potential coaches, 19 attended the first orientation session, 11 expressed interest, and eight completed all three training sessions and led walking groups for the duration of the intervention. These eight coaches identified a total of 88 potential walking members for their teams. Of these 88, 75 participated in the first enrollment data collection, 69 participated in the 3-month data collection, and 58 completed the entire 6-month intervention. Total retention rate for coaches and all walking participants from enrollment to the 6-month follow-up was 80%. As classified the CDC BMI criteria, this was a primarily overweight and obese population. Of the 83 participants (eight coaches and 75 walking members), eight (10%) were normal weight, 18 (22%) were overweight, and 57 (69%) were obese. These participants were primarily African-American (99%) women (97%) with an average age of 46.1 ($\pm$SD = 12.8) years (Table 1). Although there were no significant differences in race, marital status, education, or income between the 83 participants who enrolled and the 66 participants who completed the intervention, younger participants were significantly more likely to drop out.

Thirty-one applicants responded to the initial commu-

Table 2. Anthropometrics, Biological Measures, and Average Daily Minutes of Walking at Enrollment, 3 Months, and 6 Months ($N = 66$)

Measures	Enrollment Mean (*SD*)	3-Month Mean (*SD*)	6-Month Mean (*SD*)	*P*-Value
BMI (kg/m^2)	34.4 (9.4)	34.3 (9.6)	34.1 (9.4)	.297*
Waist circumference (cm)	40.4 (7.7)	40.4 (7.7)	39.0 (7.0)	< .001*
Systolic blood pressure (mm/Hg)	139.6 (18.6)	130.0 (17.7)	135.3 (18.5)	< .001*
Diastolic blood pressure (mm/Hg)	87.9 (10.4)	85.5 (8.9)	88.1 (10.6)	.052*
Glucose (mg/dL)	105.0 (33.6)	106.6 (41.4)	106.6 (44.3)	.852*
Total cholesterol (mg/dL)	181.6 (45.2)	188.4 (43.7)	190.3 (39.6)	.059*
LDL-C (mg/dL)	113.3 (40.9)	101.7 (45.6)	109.8 (42.3)	.169*
HDL-C (mg/dL)	49.3 (12.0)	51.2 (13.1)	57.2 (13.4)	< .001*
Triglycerides (mg/dL)	97.5 (43.8)	127.6 (107.0)	109.3 (56.7)	.233†
Body fat (%)	42.7 (9.6)	43.2 (8.1)	43.6 (7.5)	.165*
Average daily walking (min)	44.8 (52.2)	76.6 (166.6)	65.9 (89.7)	.154†

Notes. *SD*, standard deviation; LDL-C, low-density lipoprotein cholesterol; HDL-C, high-density lipoprotein cholesterol.

* ANOVA test.

† Friedman's test.

nity data collector job announcement, and 18 were interviewed. Nine data collectors were employed, attended all mandatory training, and passed required competencies. A sufficient number of data collectors were retained for the 3-month time point and a required 2-hour mini retraining session was held. For the second job announcement at 6 months, 17 applicants responded, 10 were interviewed, and five were hired, attended all required training, and passed competencies.

Triglycerides and average minutes reported walking were analyzed using Friedman's test because the data did not meet the assumptions of normality. ANOVA tests were used to analyze all other normally distributed anthropometric, biological, and psychosocial data. Participants exhibited significant improvements in waist circumference (–1.4 inches), systolic blood pressure (–4.3 mmHg), and HDL-C (+7.9 mg/dL) from baseline to 6 months. Diastolic blood pressure, BMI, percent body fat, blood glucose, total cholesterol, LDL-C, and TG did not change significantly. Although not significant, there was a trend for average minutes reported walking to increase from baseline to 3 months (+31.76 min/day) and then decline from 3 months to 6 months (–10.7 min/day), with an overall net increase in walking (Table 2).

With the exception of the family rewards and punishment social support score, Cronbach's α met the typically defined 0.7 value indicative of sufficient internal reliability (Table 3). However, no significant positive changes resulted in any of the psychosocial variables as a result of this intervention (Table 3). From enrollment to 6 months, 57% of participants indicated a positive shift in stages of change, 23% remained in the same stage, and 20% indicated a negative shift (Figure 1).

DISCUSSION

The development and implementation of this CBPR

Table 3. Internal Consistency and Social Support, Self-Efficacy, and Decisional Balance Measures at Enrollment, 3 Months, and 6 Months (N = 66)

Measures	Number of Items	Crohnbach's α at Enrollment	Enrollment Mean (SD)	3-Month Mean (SD)	6-Month Mean (SD)	P-Value
Family social support: participation and involvement	10	.92	25.1 (11.2)	24.7 (11.0)	24.5 (11.7)	.856
Family social support: family rewards and punishment	3	.14*	4.3 (1.8)	4.5 (2.4)	4.5 (2.0)	.724
Friends social support: participation and involvement	10	.91	23.2 (10.3)	24.2 (11.7)	22.3 (10.9)	.183
Self-efficacy (total score)	16	.88	3.5 (0.7)	3.4 (0.7)	3.4 (0.8)	.424
Negative affect (SS)	3	.75	3.3 (1.0)	3.3 (1.0)	3.2 (1.1)	.812
Excuse making (SS)	3	.85	2.9 (1.0)	2.8 (0.9)	2.9 (1.0)	.262
Must exercise alone (SS)	2	NA†	4.2 (0.9)	4.2 (0.7)	4.1 (0.9)	.640
Inconvenience to exercise (SS)	2	NA†	4.1 (0.8)	4.2 (0.7)	3.9 (0.9)	.011
Resistance from others (SS)	2	NA†	4.1 (0.7)	4.0 (0.7)	3.9 (1.0)	.103
Bad weather (SS)	4	.77	3.1 (1.0)	3.0 (1.1)	3.0 (1.1)	.747
Decisional balance (total score)	16	.83	1.9 (1.1)	1.7 (1.1)	1.7 (1.1)	.152
Pro score (SS)	10	.89	4.6 (0.6)	4.4 (0.7)	4.4 (0.7)	.006
Con score (SS)	6	.80	2.7 (1.1)	2.7 (1.0)	2.7 (1.0)	.857

Notes. SD, standard deviation; SS, subscore.

* Crohnbach's α indicates low internal reliability; interpret ANOVA cautiously.

† Crohnbach's α only determined for subscores with ≥3 questions.

walking intervention was considered successful as evidenced by the community's active contribution and participation in each research phase, the undertaking and application of basic research components, significant improvements in several anthropometric and biological values, and the sustainability of the partnerships formed through this intervention. The CPPE workshop was instrumental in initiating the capacity building process, and the regular monthly meetings were essential in fostering a cohesive relationship of trust and understanding among all team members. The recruitment response rates and retention rates for coaches and walking members were sufficient for a successful intervention. The pool of applicants responding to data collector announcements provided enough qualified candidates to employ and train local community members for data collection. The undertaking and application of basic research components indicated that community members and researchers were able to collaborate and effectively execute the intervention.

In further support of the success of this intervention, participants exhibited significant improvements in waist circumference, systolic blood pressure, and HDL-C. The non-normality of TG data was attributed to the large percent of enrolled participants with metabolic syndrome. Using standard classification criteria, 41% of walking participants had three or more of the five defined metabolic syndrome criteria at baseline.[30] Triglycerides are known to be elevated in individuals with metabolic syndrome.[31] This rate of metabolic syndrome is alarming, warrants further evaluation, and deserves consideration in future interventions. There was no significant change in BMI. Although energy intake was not measured, it is feasible that participants increased caloric intake to compensate for increased activity, resulting in no significant weight changes. Monthly educational sessions incorporated nutrition messages, but these components may not have been intensive enough to produce weight loss.

Although not significant, there was a trend for an overall net increase in walking. The average minutes reported walking remained nonsignificant after controlling for a few outliers and applying nonparametric statistical methods. The non-normality and large standard deviations reflected in these self-reported walking data are consistent with previous self-reported physical activity research.[23,32] Although

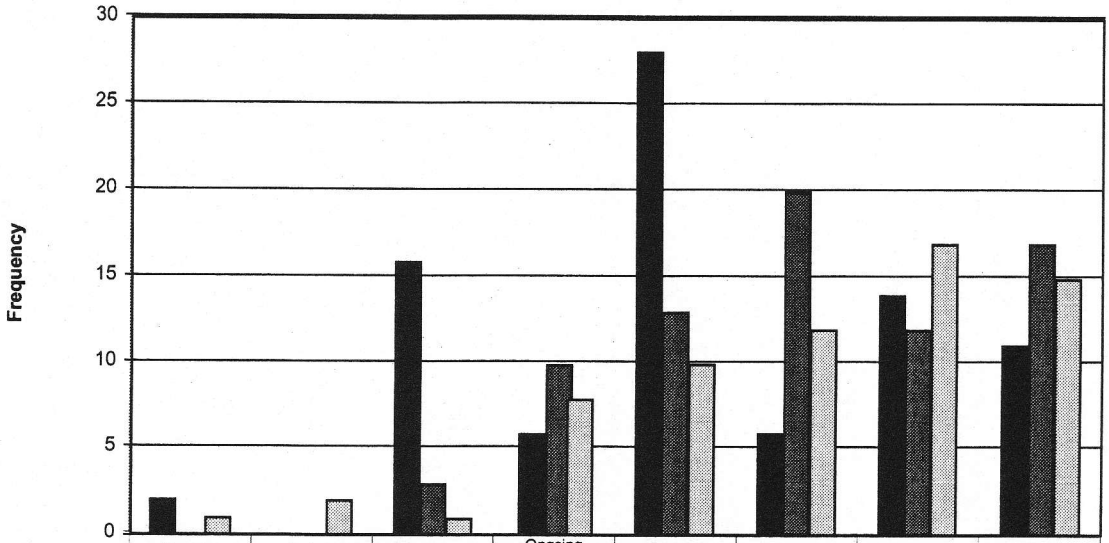

Figure 1. Shifts in stages of change at enrollment, 3 months, and 6 months ($N = 66$).

the Past Week Physical Activity Recall was the most practical instrument for assessing physical activity in this community-based intervention, the literature is replete with the difficulties and methodologic limitations in accurately measuring physical activity.[33–35] Average minutes spent walking per day was surprisingly high at baseline and indicates participants were already meeting CDC recommendations for at least 30 minutes of moderate-intensity physical activities on five or more days of the week.[36] The walking trail was installed almost a year before the intervention and observations indicate the trail was used frequently in the months preceding intervention kick-off.

The majority of participants made a positive shift in the stages of change. However, this study provided limited support to the hypotheses that social support, self-efficacy, and decisional balance as related to physical activity behaviors would improve as a result of this walking intervention. Most of the Cronbach's α met the defined 0.7 value indicative of sufficient internal reliability, yet no significant positive changes resulted from this intervention. Social support for exercise was directly targeted in the intervention through coaches regularly contacting walking participants to encourage walking and attendance of monthly educational meetings, but did not change significantly throughout the intervention. At enrollment the walking groups had already been formed and participants were aware that coaches would be assisting them in initiating and maintaining a walking program. Perhaps participants perceived adequate social support at enrollment in response to the social support received in encouraging them to participate in this intervention, leaving little room for improvement at subsequent time points.

Neither total self-efficacy nor total decisional balance score changed significantly. However, the self-efficacy inconvenience to exercise subscore and the decisional balance pro subscore significantly changed in a direction opposite than hypothesized. At enrollment, participants may have minimized the inconvenience to exercise, and during the intervention discovered that maintaining a walking program was difficult and imposed inconvenience. Similarly, participants may have rated the pro score high at first believing that regular physical activity would provide tremendous benefits, and subsequently discovered these benefits were not as great as initially perceived.

It remains unclear if these psychosocial findings were truly due to lack of improvement in psychosocial variables or due to lack of instrument responsiveness in this population. Methodologic limitations exist in using internal consistency reliability to reflect instrument responsiveness.[37] Although HNIRI researchers were aware of potential limitations with these instruments, because of building momentum and desire to initiate the intervention, the time involved to properly tailor data collection instruments and develop scoring procedures would have significantly delayed the intervention and frustrated the community. Research is emerging on the unique psychosocial factors impacting physical activity in African-American populations as well as the distinct challenges of environmental factors impacting physical activity in rural areas.[23,24,38] The unique psychosocial determinants and correlates of physical activity in rural minority populations and the need to develop culturally sensitive instruments should be a research priority.

Several limitations exist with this CBPR intervention. Immeasurable social, cognitive, and physiological changes were likely occurring from July 2003 to April 2005 as a result of the community–university–government partnership formed and increased exposure to the HNIRI messages promoting improved health. The nature of CBPR makes it extremely difficult to control for these changes. Another concern with self-reported instruments is the social desirability bias, whereby participants may have either consciously or unconsciously presented themselves in an overly positive manner. Additionally, the quasi-experimental design and resulting sample size may not have been sensitive enough to detect other significant changes.

The overall planning, delivery, and evaluation of the *Fit for Life Steps* intervention was successful and the sustainable partnerships will bring long-term opportunities to the community. Partners involved in this research experience have gained a greater appreciation for the continuous demand for mutual understanding and trust. The community now has confidence in the ability of university partners to deliver a structured intervention, and the researchers value the unique needs and dynamics of the community. Plans are currently underway to build on the mutual trust to develop and implement a second CBPR intervention.

Although all successful partnerships are not alike, several lessons learned through this intervention may be generalizable to other community–university–government partnerships and are summarized here:

1. Allow sufficient time for capacity building and intervention development. Building person-to-person relationships between community members and researchers, and organization-to-organization relationships between community and academic organizations is time consuming. It was nearly 2 years from the initial CPPE workshop to the intervention kickoff. Nevertheless, nurturing this relationship and ensuring that the community was a central partner in all phases of the research was critical to the success of this intervention.
2. Offer multiple involvement opportunities for community members. Different options for involvement including the CPPE process, monthly HNIRI meetings, coaches training, walking participation, and data collection appealed to a variety of community members and greatly contributed to the overall success of this intervention. Although employment of community members for data collection added a unique challenge for the researchers to develop and deliver appropriate training, the intensive contact and relationships formed in training and execution of data collection made this an extremely rewarding element of the partnership.
3. Understand the limitations of using previously developed health-related psychosocial instruments. Future researchers embracing the CBPR model in minority populations will encounter similar difficulties in selecting and developing health-related psychosocial instruments. The lack of valid and reliable theory-based behavioral instruments for minority populations is problematic. Developing and validating tailored instruments is a time-consuming component of the already lengthy CBPR process.
4. Funding agencies need to be flexible and appreciate the complexity of CBPR projects. Although funding agencies rightfully require documented improved community outcomes, capturing these outcomes is more complex than traditional community-based research. CBPR is more than just answering a research question; it also encompasses time-intensive components much more difficult to measure, such as building collaborative relationships, creating social change, and developing a community's research skills.

ACKNOWLEDGMENTS

The authors acknowledge contributions from all members of the Hollandale NIRI Community Committee, with special thanks to Hollandale NIRI Chairperson Helen Perkins, Hollandale NIRI staff members Demetric Warren and Shirley Vassar, and Karen Vassel with the Mississippi State University Cooperative Extension Service. We also appreciate Doris Thompson's assistance in reviewing the manuscript and the statistical support provided by Ann Beardshall and J. T. Johnson.

REFERENCES

1. *Morgan Quitno's Healthiest State Award 2005.* Lawrence, KS: Morgan Quitno Press; 2005.
2. U.S. Census Bureau [homepage on the Internet]. Washington, DC: [Updated 2006 March 28; cited 2006 December 1]. Available from www.census.gov.
3. Lower Mississippi Delta Nutrition Intervention Research Consortium. Self-reported health of residents of the Mississippi Delta. *J Health Care Poor Underserved.* 2004; Nov; 15(4): 645–662.
4. Smith J, Lensing S, Horton J, Lovejoy JA, Zaghlouol S, Forrester I, et al. Prevalence of self-reported nutrition-related health problems in the Lower Mississippi Delta. *Am J Public Health.* 1999; 89: 1418–1421.
5. Yadrick K, Horton J, Stuff J, McGee B, Bogle M, Davis L, et al. Perceptions of community nutrition and health needs in the Lower Mississippi Delta: A key informant approach. *J Nutr Edu.* 2001; 33: 266–277.
6. Warren-Findlow J, Prohaska T, Freedman D. Challenges and opportunities in recruiting and retaining underrepresented populations into health promotion research. *Gerontologist.* (2003); 43: 37–47.
7. Flaskerud J, Winslow B. Conceptualizing vulnerable populations health-related research. *Nurs Res.* 1998; 47: 69–78.
8. Adult Literacy Estimates [homepage on the Internet]. San Diego: *CASAS.* [updated 22 May 2005; cited 1 December 2006]. Available from www.casas.org/lit/litcode/Search.cfm.
9. Israel B, Schulz A, Parker E, Becker A. Review of community based research: Assessing partnership approaches to improve public health. *Annu Rev Public Health.* 1998; 19: 173–202.
10. Schwenk F. History and overview of the Lower Mississippi Delta Nutrition Intervention Research Initiative. In: Harrison G, editor. *Nutrition and health status in the Lower Mississippi Delta of Arkansas, Louisiana, and Mississippi: A review of existing data.* Rockville, MD: Westat 1997. p. 1–3.
11. Champagne C, Bogle M, McGee B, Yadrick K, Allen HR, Kramer TR, et al. Dietary intake in the Lower Mississippi Delta Region: Results for the Foods of Our Delta Study. *J Am Diet Assoc.* 2004; 104: 199–207.
12. Ndirangu M. *Evaluating the effectiveness of the Delta Nutrition Intervention Research Initiative (NIRI) community-academic coalitions as perceived by community partners* [dissertation]. Hattiesburg (MS): The University of Southern Mississippi, Department of Nutrition and Food Systems; 2005.
13. Brownson R, Baker E, Boyd R, Caito NM, Duggan K, Housemann RA, et al. A community-based approach to promoting walking in rural areas. *Am J Prev Med.* (2004); 27: 28–34.
14. Lamb S, Bartlett H, Ashley A, Bird D. Can lay-led walking programs increase physical activity in middle aged adults? A randomized controlled trial. *J Epidemiol Community Health.* 2002; 56: 246–252.
15. Mettler M, Stone W, Herrick A, Klein D. Evaluation of a community-based physical activity campaign via the transtheoretical model. *Health Promot Pract.* 2000; 1: 351–359.
16. Sherwood N, Jeffrey R. The behavioral determinants of exercise: Implications for physical activity interventions. *Annu Rev Nutr.* 2000; 20: 21–44.
17. Sallis J, Hovell M, Hofstetter C, Barrington E. Explanation of vigorous activity during two years using social learning variable. *Soc Sci Med.* 1992; 34: 25–32.
18. Carron A, Hausenblaus H, Mack D. Social influence and exercise: A meta-analysis. *J Sport Exerc Psychol.* 1996; 18: 1–16.
19. Sallis J, Hovell M, Hofstetter C. Predictors of adoption and maintenance of vigorous physical activity in men and women. *Prev Med.* 1992; 21: 237–251.
20. Marcus B, Eaton C, Rossi JS, Harlow LL. Self-efficacy, decision-making, and stages of change: An integrative model of physical exercise. *J Appl Soc Psychol.* 1994; 24(6): 489-508.
21. Marcus B, Selbry V, Niaura R, Rossi J. Self-efficacy and the stages of exercise behavior change. *Res Q Exerc Sport.* 1992; 63: 60–66.
22. Prochaska J, DiClemente C, Norcorss J. In search of how people change: Applications to addictive behaviors. *Am Psychol.* 1992; 47: 1102–1114.
23. Castro CM, Sallis JF, Hickman SA, Lee RE, Chen AH. A prospective study of psychosocial correlates of physical activity for ethnic minority women. *Psychol Health.* 1999; 14: 277–293.
24. Ainsworth BE, Anderson LA, Becker DM, Blalock SJ, Brown DR, Brownson RC, et al. Community prevention study: contributions to women's health and prevention research. *J Women's Health Gend Based Med.* 2001; 10: 913–920.
25. Miilunpalo S, Nupponen R, Laitakari J, Martila T, Paronen O. Stages of change in two modes of health-enhancing physical activity: Methodological aspects and promotional implications. *Health Educ Res.* 2000; 15: 435–448.
26. Sallis J, Grossman R, Pinski R, Patterson T, Nader P. The development of scales to measure social support for diet and exercise behaviors. *Prev Med.* 1987; 16: 825–836.
27. Rubiano F, Nunez C, Heymsfield, S. A comparison of body composition techniques. *Ann N Y Acad Sci.* 2000; 904: 335–338.
28. Ainsworth BE, Bassett DR, Stratch SJ, Swartz AM, O'Brien WL, Thompson RW, et al. Comparison of three methods for measuring the time spent in physical activity. *Med Sci Sports Exerc.* 2000; 32 Suppl 9: S457–S464.
29. Dubbert P, Carithers T, Ainsworth B, Taylor H, Wilson G, Wyatt S. Physical activity assessment methods in the Jackson Heart Study. *Ethn Dis.* 2005;15 Suppl S6: 56–60.
30. Alexander C, Landsman P, Teutsch S, Haffner S. NCEP-defined metabolic syndrome, diabetes, and prevalence of coronary heart disease among NHANES III participants age 50 years and older. *Diabetes.* 2003, 52: 1210–1214.
31. Zimmet P, Magliano D, Matsuzawa Y, Alberti G, Shaw J. The metabolic syndrome: a global public health problem and a new definition. *J Atheroscler Thromb.* 2005; 12: 295–300.

32. Smith D, Domholdt E, Coleman K. del Aguila M, Boone D. Ambulatory activity in men and diabetes: relationship between self-reported and real-world performance-based measures. *J Rehabil Res Dev.* 2004; 41: 571–580.

33. Klesges R, Eck L, Mellon M, Fulliton W, Somes G, Hanson C. The accuracy of self-reports of physical activity. *Med Sci Sports Exerc.* 1990; 22: 690–697.

34. Bassett DJ. Validity and reliability issues in objective monitoring of physical activity. *Res Q Exerc Sport.* 2000; 71 Suppl: S30–S36.

35. Haskell W, Kiernan M. Methodologic issues in measuring physical activity and physical fitness when evaluating the role of dietary supplements for physically activity people. *Am J Clin Nutr.* 2000); *72* Suppl: 541S–550S.

36. Center for Disease Control and Prevention [homepage on internet]. Atlanta: Centers for Disease Control [updated 25 April 2006; cited 2006 December 1]. *Physical Activity for Everyone Recommendations.* Available from www.cdc.gov/nccdphp/dnpa/physical/recommendations/index.htm.

37. Puhan MA, Bryant D, Guyatt GH, Heels-Ansdell D, Schunemann HJ. Internal consistency reliability is a poor predictor of responsiveness. *Health Qual Life Outcomes.* 2005; 3: 33.

38. James A, Hudson M, Campbell M. Demographics and psychosocial correlates of physical activity among African-Americans. *Am J Health Behav* 2003; 27: 421–431.